

Remarks

INTRODUCTION

Applicant thanks the Examiner for carefully considering the subject application.

Applicant has amended pending claims 5, 7, 9, 11, 18, 19 and 21 to better describe the invention. Applicant requests that the pending claims be allowed.

However, before discussing the claims in detail, Applicant believes it would be helpful to first review several details of the application. As previously discussed, the present application related to controlling introduction of air into the exhaust of an engine to improve the control of exhaust emissions. Specifically, the present application relates to a system using an emission control device that stores hydrocarbons positioned downstream of an upstream emission control device. Further, the air is introduced after the downstream emission control device reaches a preselected temperature. And since the release of hydrocarbons corresponds to this temperature, the air is introduced at an appropriate time. See paragraphs [0003]-[0008], for example, of the specification.

However, as discussed at paragraphs [0024]-[0032] and described by Figures 2A and 2B, in one example embodiment, the introduction of air not only provides for efficient conversion of released hydrocarbons, but can also lower temperature of the emission control devices. As recognized by the inventor herein, this can result in degraded performance if there is too much cooling caused by the introduced air in the exhaust.

Therefore, in one example approach, the amount of air provided in the exhaust is adjusted to be greater or less to prevent temperature from falling too low. Further, the approach can also utilize engine operating conditions, such as load, to

determine how much air should be provided to properly balance the conversion with temperature maintenance.

REJECTION OF CLAIMS 18-21 UNDER U.S.C. 102(e)

The Examiner has rejected claims 18-21 under 35 U.S.C. 102(e) as being anticipated by Twigg (U.S. Patent 6,651,424). Applicant respectfully submits that the rejection of claims 18-21 is improper because Twigg does not teach all of the limitations of claim 18.

Claim 18 recites:

A method for controlling an air-fuel mixture in an internal combustion engine, comprising:

determining a temperature of a downstream emission control device located following a upstream emissions control device;

commencing oxidizing hydrocarbons stored in said downstream device when said temperature of said downstream device is greater than a predetermined temperature by providing a predetermined air mass in a location following said upstream emissions control device and before said downstream emissions device, wherein said oxidizing hydrocarbons is accomplished by providing a sufficient air mass to said downstream device without lowering the temperature of said downstream device below a predetermined threshold; and

adjusting the air-fuel ratio in the engine rich of stoichiometry during oxidation of said hydrocarbons.

The Examiner states that Twigg "discloses that oxidizing hydrocarbons is accomplished by providing a sufficiently intermittent air mass to said downstream device (col. 3, lines 48-50)." Page 3 of paper #19.

Whether Twigg shows providing a sufficiently intermittent air mass to said downstream device is not enough to anticipate claim 18. As quoted above, claim 18 goes on to require that "said oxidizing hydrocarbons is accomplished by providing a sufficient air mass to said downstream device without lowering

the temperature of said downstream device below a predetermined threshold..." Emphasis added. This enables improved performance and advantageous operation since a proper temperature can be maintained even when oxygen is introduced in the exhaust.

Applicant can find no disclosure in Twigg of a method that ensures the intermittent air mass does not lower the temperature of the downstream device below a predetermined threshold. Unlike Applicant (see paragraph [0023], for example), Twigg appears to be totally unaware that the added oxygen could lower the temperature to an unacceptable point which would actually cause emissions to degrade. Thus, Twigg fails to solve a problem recognized by Applicant, and fails even to realize the problem can exist.

As such, Applicant respectfully requests the Examiner to reconsider the application of Twigg to Claim 18, and to pass said claim to allowance. Claims 19-21 depend from claim 18 and therefore should also be allowed.

REJECTION OF CLAIMS 5, 7, 14, AND 15 UNDER U.S.C 102(e)

The Examiner has rejected Claim 5 35 U.S.C. 102(e) and has cited Twigg (U.S. Patent 6,651,424), and Mizuno et al. (U.S. 6,029,441). Amended claim 5 Recites:

A method for controlling an air-fuel mixture in an internal combustion engine, comprising:

determining a temperature of a downstream emission control device, said downstream emission control device located following an upstream emission control device;

oxidizing hydrocarbons stored in said downstream emission control device when said temperature of said downstream emission control device is greater than a predetermined temperature by providing an air amount in a location following said upstream emission control device and before said downstream emissions device,

where said air amount is provided by an air pump, and wherein said oxidizing hydrocarbons is accomplished by adjusting said air pump to provide a varying amount of air mass to said downstream device to oxidize hydrocarbons without lowering said temperature of said downstream device below a predetermined threshold.; and
adjusting the air/fuel ratio in the engine rich of stoichiometry during oxidation of said hydrocarbons.

As noted above, Applicant can find nothing in Twigg which shows adjusting said air pump to provide a varying amount of air mass to said downstream device to oxidize hydrocarbons without lowering said temperature of said downstream device below a predetermined threshold. Further, Applicant can find nothing in Mizuno et al. which shows such a feature.

Regarding claim 7, Applicant can find nothing in Twigg which shows activating the air pump when a determined temperature (of the downstream emission control device) is greater than a preselected threshold. Rather, Twigg appears to follow a different approach by activating the air pump upon engine cranking (starting). See Col. 4, lines 36-37, as well as Col. 3, line 40, and line 45.

As such, claims 5-7 should be allowed. Claims 14-15 depend from claim 5 and therefore should be allowed

REJECTION OF CLAIMS 9 AND 10 UNDER U.S.C 102(e)

The Examiner has rejected Claim 9 under 35 U.S.C. 102(e) and has cited Twigg (U.S. Patent 6,651,424), and Mizuno et al. (U.S. 6,029,441). Amended claim 9 Recites:

A system controlling an air-fuel ratio in an internal combustion engine, comprising:
a hydrocarbon trap positioned in an exhaust path downstream of a first emission control device, said first emission control device being located downstream of said engine;

an air supply device positioned downstream of said first emission control device to supply air upstream of said hydrocarbon trap; and

a controller configured to activate said air supply device when temperature of said hydrocarbon trap is greater than a predetermined temperature, thereby delivering oxygen to said hydrocarbon trap when temperature of said hydrocarbon trap is greater than said predetermined temperature, said controller further configured to adjust an air/fuel ratio in said engine rich of stoichiometry during said air delivery and to adjust said air supply device to vary an amount of oxygen delivered to said hydrocarbon trap to prevent said temperature of said hydrocarbon trap from falling below a threshold value by pulsing said air supply device.

As noted above with regard to claim 18, Applicant can find nothing in Twigg which shows adjusting the air supply device to vary an amount of oxygen delivered to said hydrocarbon trap to prevent said temperature of said hydrocarbon trap from falling below a threshold value by pulsing said air supply device. Rather, the text at Col. 3, lines 47-53 has no mention of temperature, but simply states:

... In a further embodiment, the secondary air addition may be additionally activated in an intermittent manner upon detection or approximation of an operating condition that requires supplementary air, for example in the event of high sulphur levels causing poisoning of the three-way catalyst...

Further, Applicant can find nothing in Mizuno et al. which shows such a feature.

As another example, Applicant can find nothing in Twigg which shows activating said air supply device when temperature of said hydrocarbon trap is greater than a predetermined temperature.

Therefore, based on the before-mentioned missing elements of Applicant's Claim 9, Applicant believes that Claim 9 should be passed to issuance. Claim 10 depends from claim 9 and therefore should also be allowed.

REJECTION OF CLAIMS 11 AND 22 UNDER U.S.C 102(e)

The Examiner has rejected Claim 11 under 35 U.S.C. 102(e) and has cited Mizuno et al. (U.S. 6,029,441). Amended claim 11 Recites:

A method for controlling an engine, said engine communicating with a first emission control device, said first emission control device communicating with a second emission control device, said method comprising:
determining a temperature of said second emission control device;
combusting an air-fuel mixture rich of stoichiometry in an engine cylinder to reduce NOx stored in said first emission control device; and
applying oxygen upstream of said second emission control device to oxidize hydrocarbons stored in said second emission control device and hydrocarbons from said combusted rich air-fuel mixture when said determined temperature of said second emission control device is greater than a predetermined temperature, where an amount of said oxygen applied upstream of said second emission control device is provided by a pump, and said amount is varied based on said determined temperature by pulsing said pump.

As noted above, Applicant can find nothing in Mizuno et al. which shows that the amount of oxygen applied upstream of the second emission control device is varied based on a determined temperature of the downstream emission control device by pulsing an air pump.

As such, claim 11 should be allowed. Claim 22 should also be allowed since it depends from claim 11.

REJECTION OF CLAIM 16 UNDER U.S.C 103(c)

The Examiner has rejected Claim 16 35 U.S.C. 103 and has cited Twigg (U.S. Patent 6,651,424) in view of Hirota et al. (U.S. 6,367,246). Amended claim 16 further limits claim 5 to require that the air amount provided by the air pump is

increased as engine load increases. The Examiner admits Twigg fails to show this features, but goes on to state that:

Hirota teaches that the amount of hydrocarbon adsorbed in the adsorber increases with the increase in the value of engine load (see col. 8, lines 3-9); therefore, one having ordinary skill in the art would realize that the air amount should be increased to oxidize the larger amount of hydrocarbon desorbed from the adsorber due to the increasing of engine load, so as to improve the efficiency of the regeneration of the hydrocarbon adsorber. Page 4 of paper #19

Applicant does not share the Examiner's opinion or conclusion. First, the above assertion does not logically follow. Even assuming the amount of hydrocarbon adsorbed increases with engine load, this in fact says *nothing* as to the amount of hydrocarbon desorbed. The Examiner has made this leap and used it as a basis of the rejection without any supporting evidence in the record. As such, Applicant objects.

In other words, the Examiner presumes that since the amount of hydrocarbon adsorbed increase with engine load, that this mandates that the amount of hydrocarbons desorbed increases with engine load. However, there is no evidence of record to support this reasoning, or whether one skilled in the art in fact would come to this conclusion. Rather, this reasoning is actually in contradiction to the reasoning given by Applicant in the originally filed specification.

As described in Applicant's specification at paragraph [0031], the air amount is increased with engine load to enable the purging of the hydrocarbons and oxidation of rich gasses to continue even though a potentially richer air-fuel ratio is utilized. Further, the increased air mass at higher loads is

acceptable since it is less likely that the emission system will be cooled by the added air since there is greater thermal energy in the exhaust at higher loads.

Therefore, Applicant respectfully submits that there is actually no motivation of record to support the combination and modification of the applied references. Therefore, claim 16 should be allowed.

CONCLUSION

Based on the foregoing comments, the above-identified application is believed to be in condition for allowance, and such allowance is courteously solicited.

Please charge any cost incurred in the filing of this Amendment, along with any other costs, to Deposit Account 06-1510. If there are insufficient funds in this account, please charge the fees to Deposit Account No. 06-1505. A duplicate copy of this sheet is enclosed.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450 on March 2, 2004.



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